Early validation of level 1b using the NESDIS real-time system

February 2002 AIRS science team meeting

- NOAA/NESDIS
- Mitch Goldberg
- Walter Wolf
- Lihang Zhou
- Yanni Qu
- Murty Divarkarla

Validation of Level 1b

- Developing tools to validate level 1b globally and for individual granules.

- Global validation uses level 3 gridded datasets.

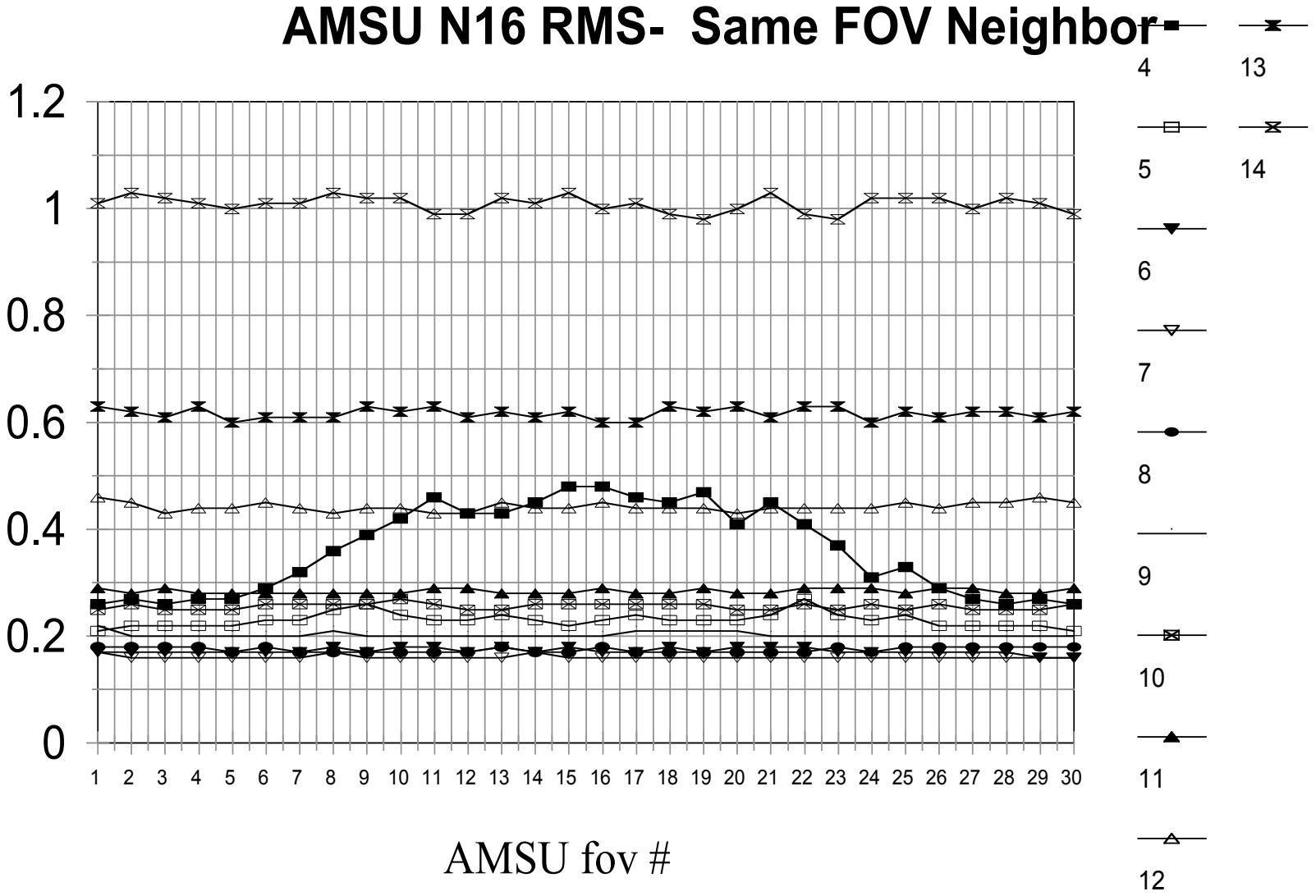
Offline system for monitoring/validation

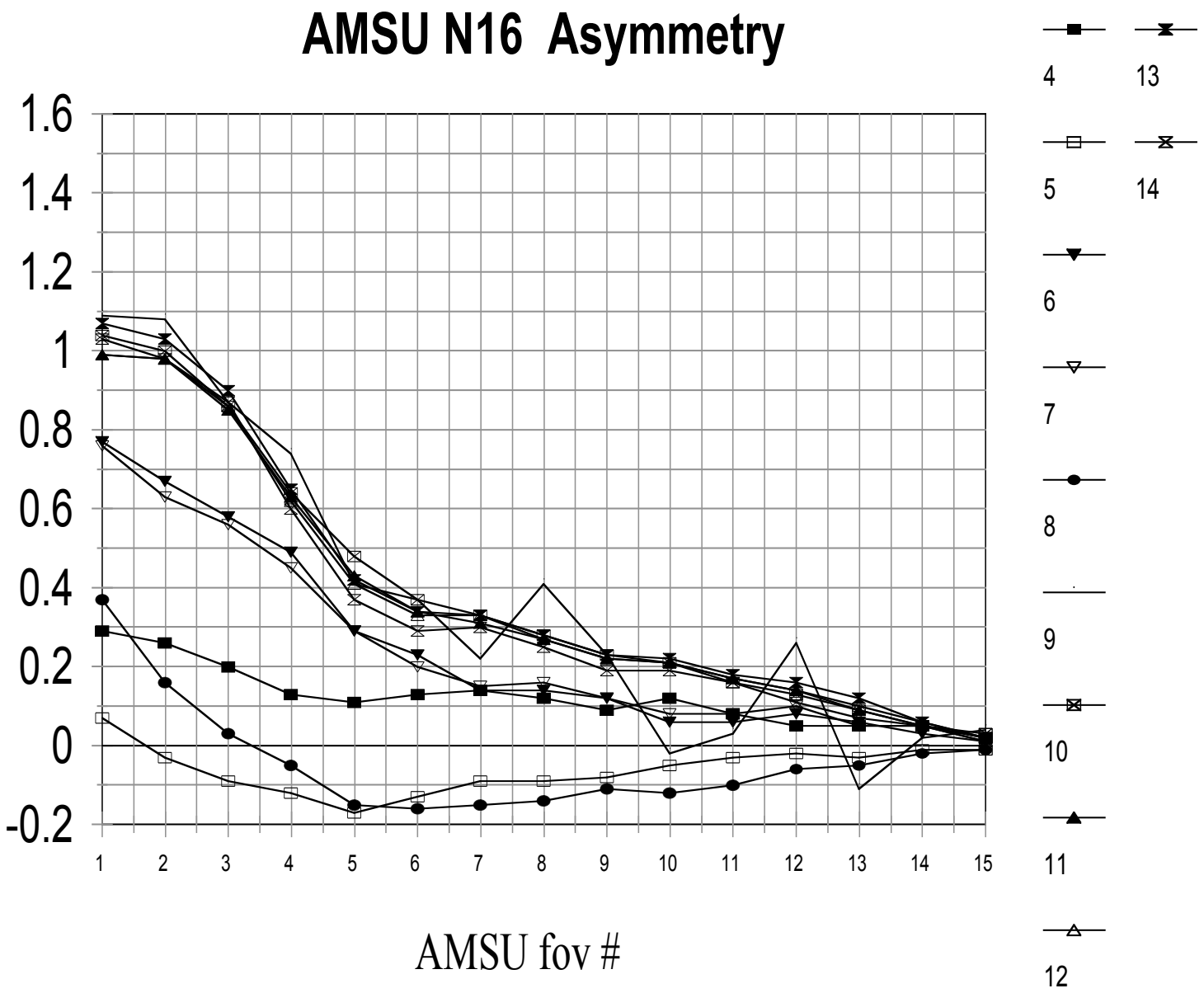
- Daily Global Grids (0.5 x 2.0 resolution) of
  observed radiances (center fov)
  cloud cleared radiances
  principal component scores of above
  retrievals from level 2 support file
  NCEP and ECWMF forecasts
  clear simulated radiances from NCEP and ECMWF

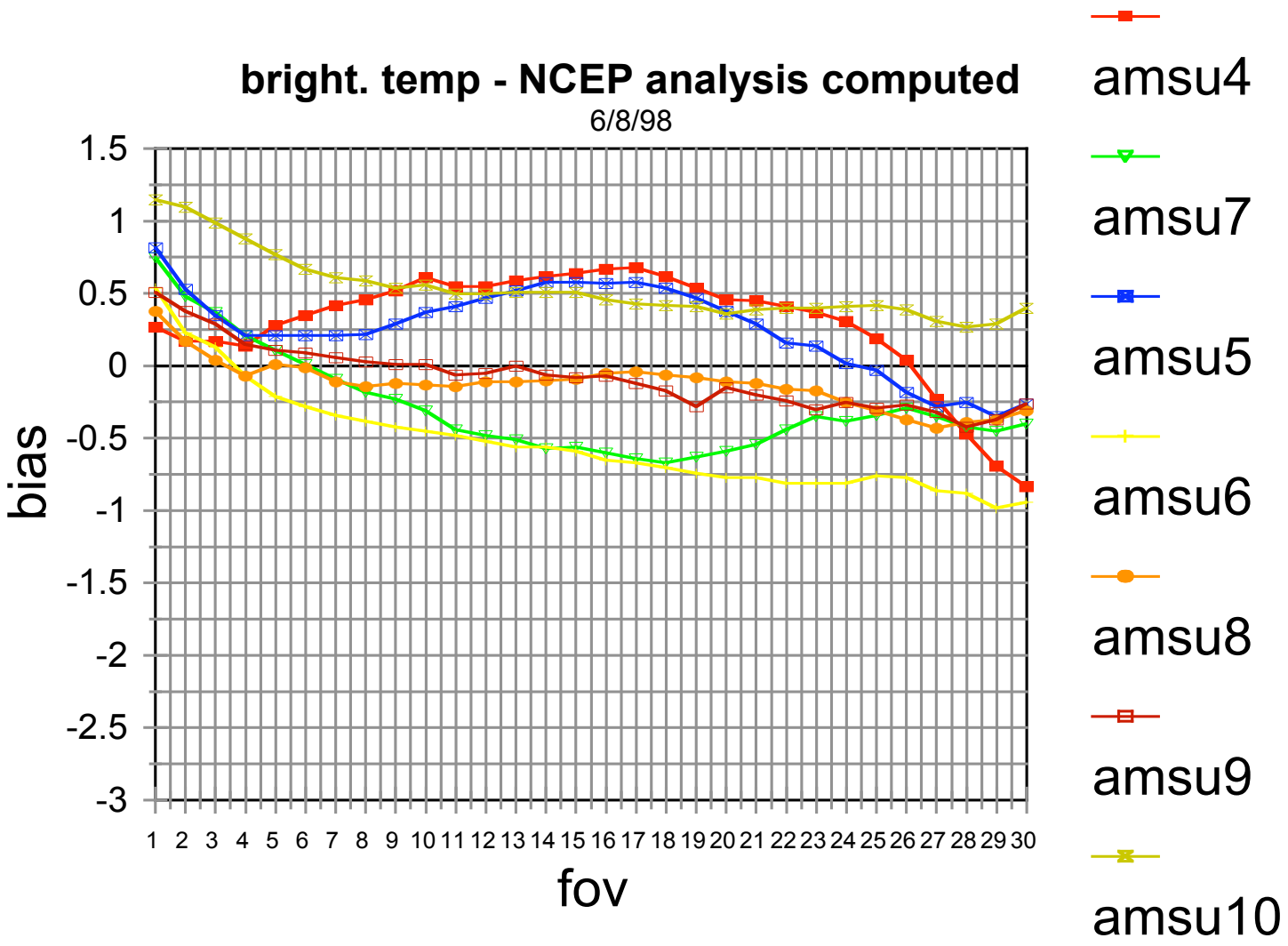
- Radiosonde collocations

Data used for validation as well as generation of coefficients.

- Compute mean radiances as function of fov
- Examine asymmetry.
- Compute standard deviation of adjacent fovs.
- Compute measured – calculated brightness temperatures as function of fov
- Monitor differences as a function of time.
- Display global fields
- Eigenvectors – information content


AMSU N16 RMS- Same FOV Neighbor
1.2
1
0.8
0.6
0.4
0.2
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
AMSU fov #
4
5
6
7
8
9
10
11
12
13
14


AMSU N16 Asymmetry
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
AMSU fov #
4
13
5
14
6
7
8
9
10
11
12


bright. temp - NCEP analysis computed
6/8/98
bias
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
fov
amsu4
amsu7
amsu5
amsu6
amsu8
amsu9
amsu10

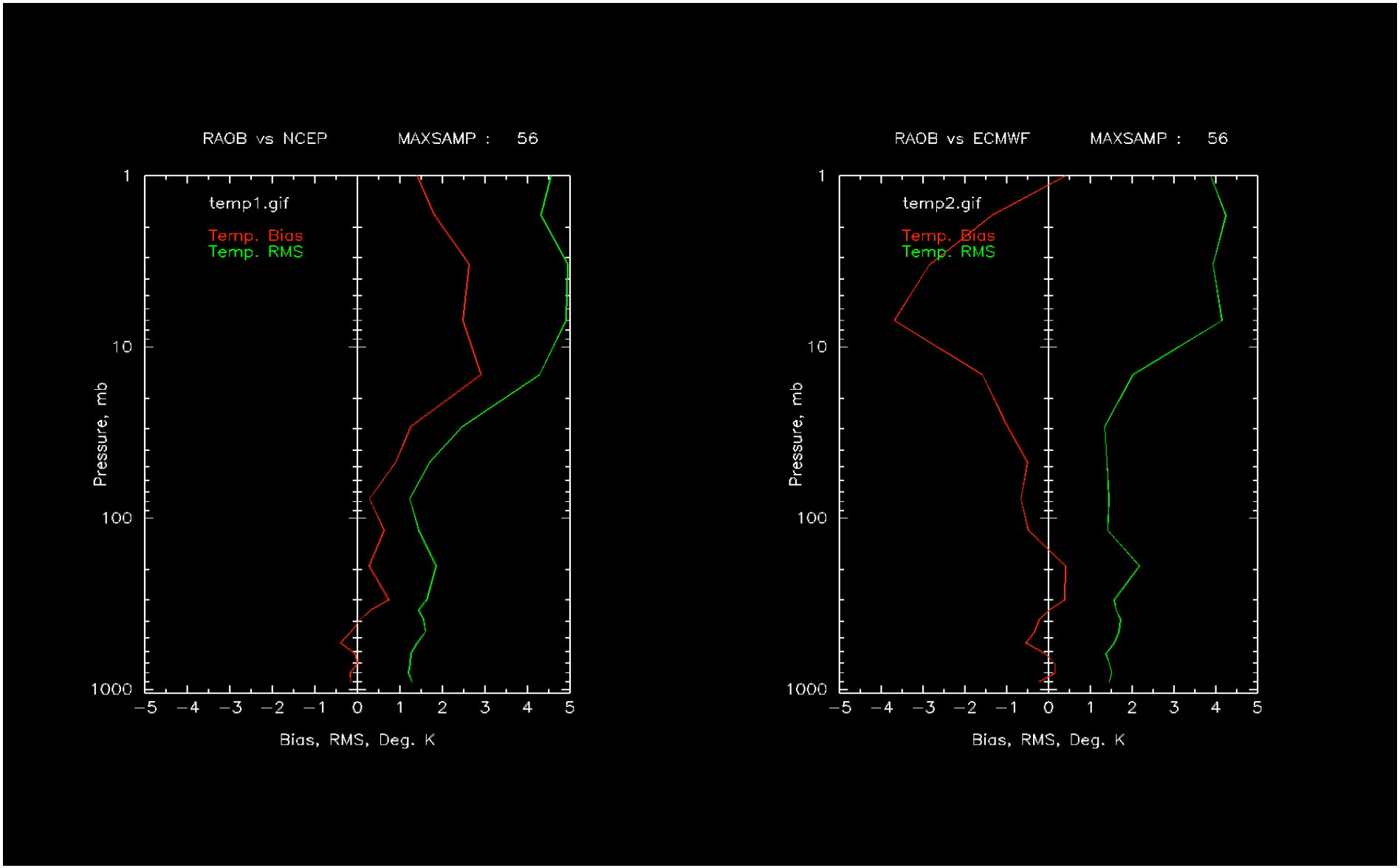
Continuous Validation

- Daily Global Grids will be archived.
- Determine clear AIRS fovs.
- Generate weekly measured – calculated statistics.

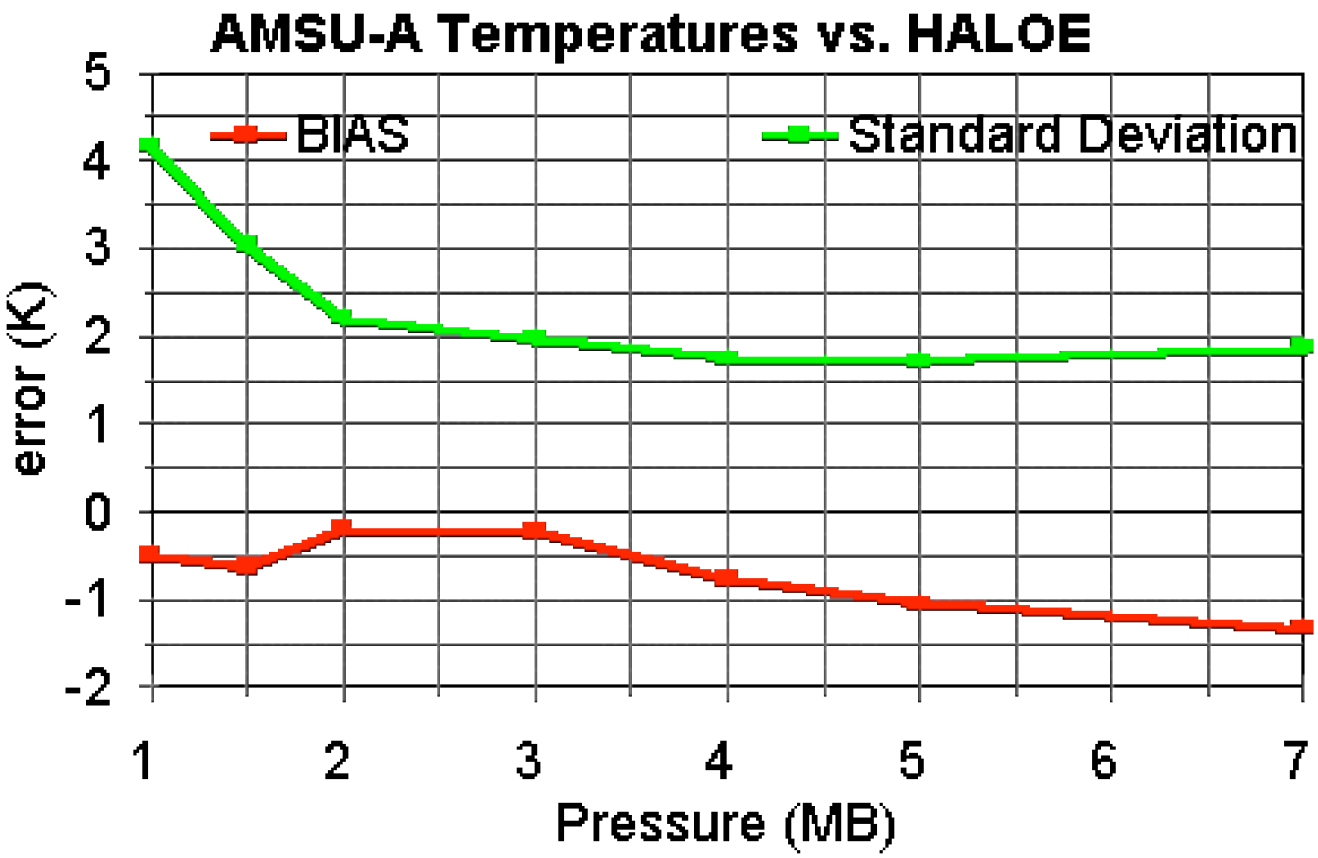
- ECMWF and NCEP forecasts are being used for “validation”

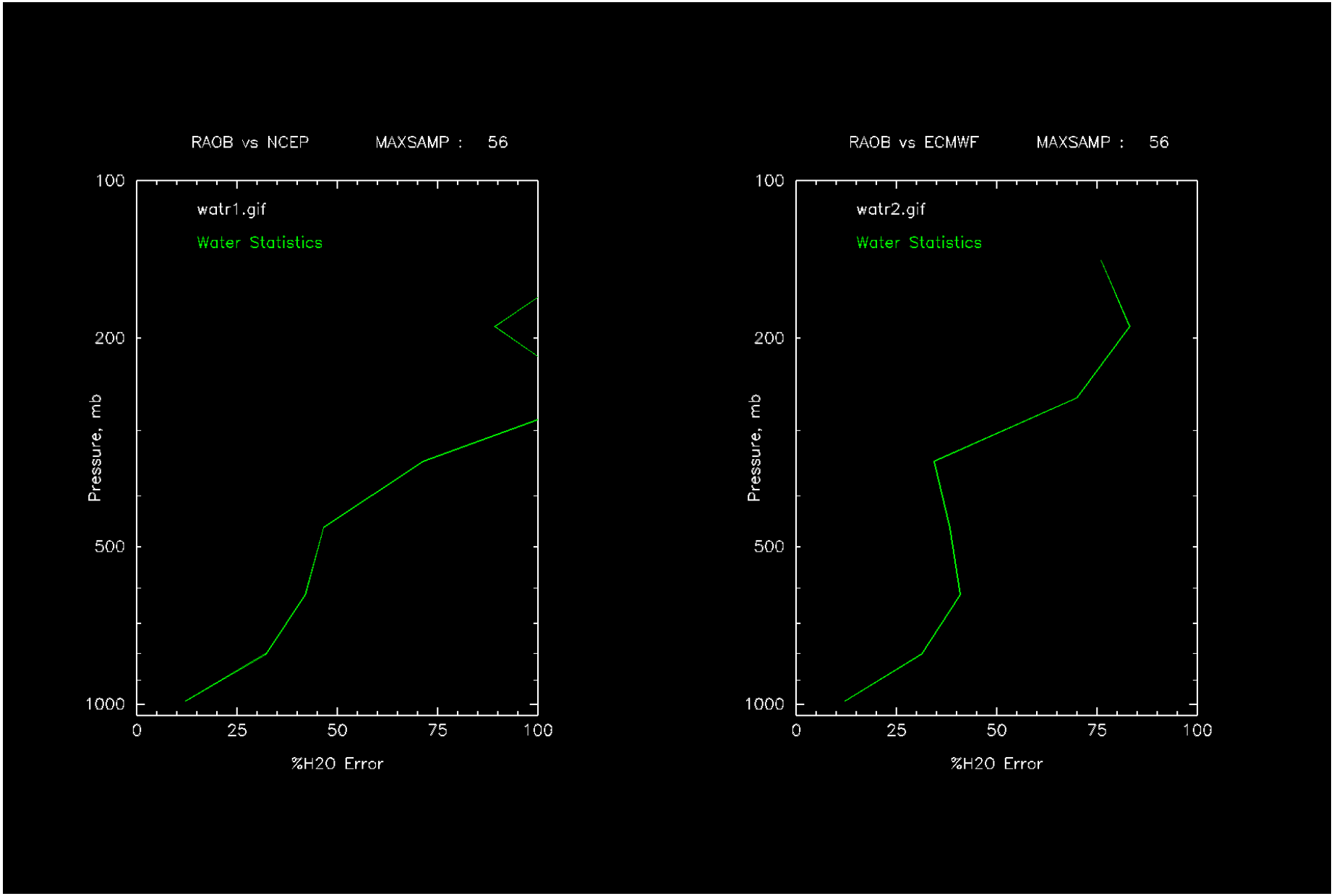
- Need to know limitations of these models.

NCEP and ECMWF comparisons



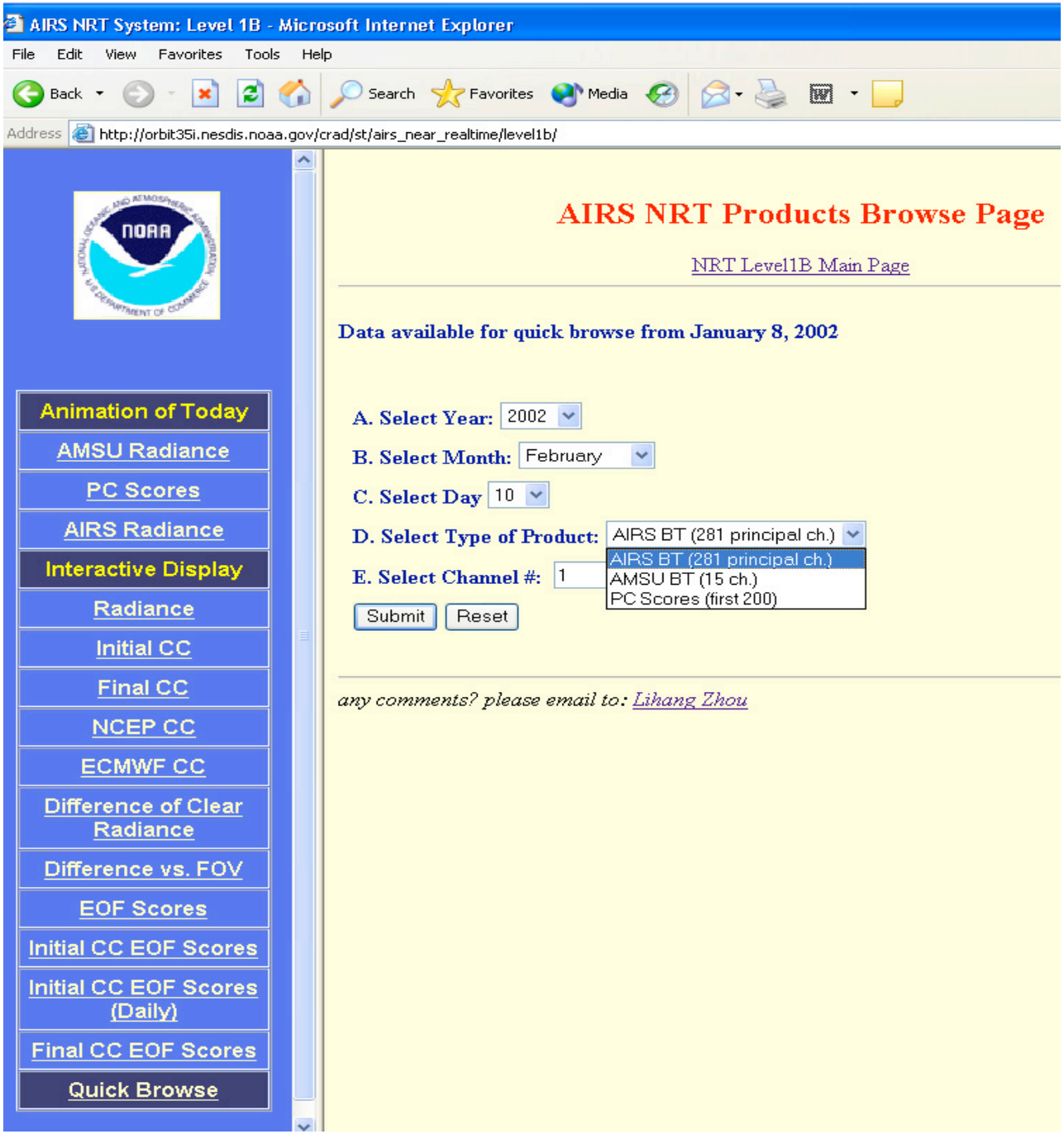
Which is right? Perhaps neither

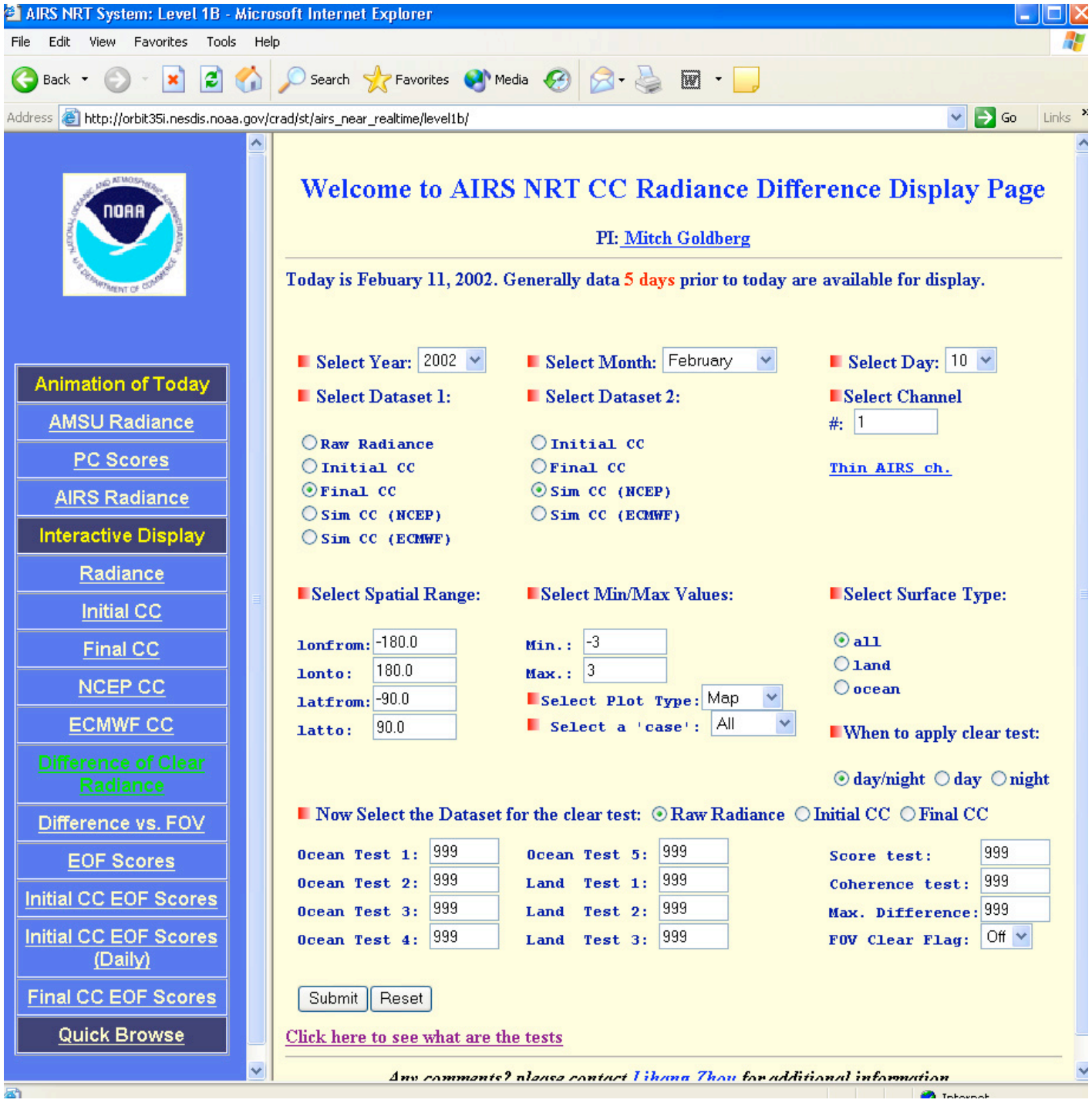
- 


RAOB vs NCEP
MAXSAMP : 56
watr1.gif
Water Statistics
Pressure, mb
100
200
500
1000
0
25
50
75
100
%H2O Error
RAOB vs ECMWF
MAXSAMP : 56
watr2.gif
Water Statistics
Pressure, mb
100
200
500
1000
0
25
50
75
100
%H2O Error

Tools

- Web-based tools
- Stand-alone tools
- Both use GRADS Display Software


AIRS NRT System: Level 1B - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://orbit35i.nesdis.noaa.gov/crad/st/airs_near_realtime/level1b/
Animation of Today
AMSU Radiance
PC Scores
AIRS Radiance
Interactive Display
Radiance
Initial CC
Final CC
NCEP CC
ECMWF CC
Difference of Clear Radiance
Difference vs. FOV
EOF Scores
Initial CC EOF Scores
Initial CC EOF Scores (Daily)
Final CC EOF Scores
Quick Browse
AIRS NRT Products Browse Page
NRT Level1B Main Page
Data available for quick browse from January 8, 2002
A. Select Year: 2002
B. Select Month: February
C. Select Day 10
D. Select Type of Product: AIRS BT (281 principal ch.)
AIRS BT (281 principal ch.)
AMSU BT (15 ch.)
PC Scores (first 200)
E. Select Channel #: 1
Submit Reset
any comments? please email to: Lihang Zhou


AIRS NRT System: Level 1B - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://orbit35i.nesdis.noaa.gov/crad/st/airs_near_realtime/level1b/
Go Links
NOAA
Animation of Today
AMSU Radiance
PC Scores
AIRS Radiance
Interactive Display
Radiance
Initial CC
Final CC
NCEP CC
ECMWF CC
Difference of Clear Radiance
Difference vs. FOV
EOF Scores
Initial CC EOF Scores
Initial CC EOF Scores (Daily)
Final CC EOF Scores
Quick Browse
Welcome to AIRS NRT CC Radiance Difference Display Page
PI: Mitch Goldberg
Today is Febuary 11, 2002. Generally data 5 days prior to today are available for display.
Select Year: 2002
Select Month: February
Select Day: 10
Select Dataset 1:
Raw Radiance
Initial CC
Final CC
Sim CC (NCEP)
Sim CC (ECMWF)
Select Dataset 2:
Initial CC
Final CC
Sim CC (NCEP)
Sim CC (ECMWF)
Select Channel #: 1
Thin AIRS ch.
Select Spatial Range:
lonfrom: -180.0
lonto: 180.0
latfrom: -90.0
latto: 90.0
Select Min/Max Values:
Min.: -3
Max.: 3
Select Plot Type: Map
Select a 'case': All
Select Surface Type:
all
land
ocean
When to apply clear test:
day/night day night
Now Select the Dataset for the clear test: Raw Radiance Initial CC Final CC
Ocean Test 1: 999
Ocean Test 2: 999
Ocean Test 3: 999
Ocean Test 4: 999
Ocean Test 5: 999
Land Test 1: 999
Land Test 2: 999
Land Test 3: 999
Score test: 999
Coherence test: 999
Max. Difference: 999
FOV Clear Flag: Off
Submit Reset
Click here to see what are the tests
Any comments? please contact Lihang Zhou for additional information

Summary

- Use Grads Web-based and stand-alone display tools.
- Compare measured vs calculated.
- Generate eigenvectors and look at information content.
- Find clear cases.
- Generate regression retrievals.
- Check accuracy on dependent and independent data. Compare with radiosondes
- Monitor errors over time.

Surface emissivity concerns

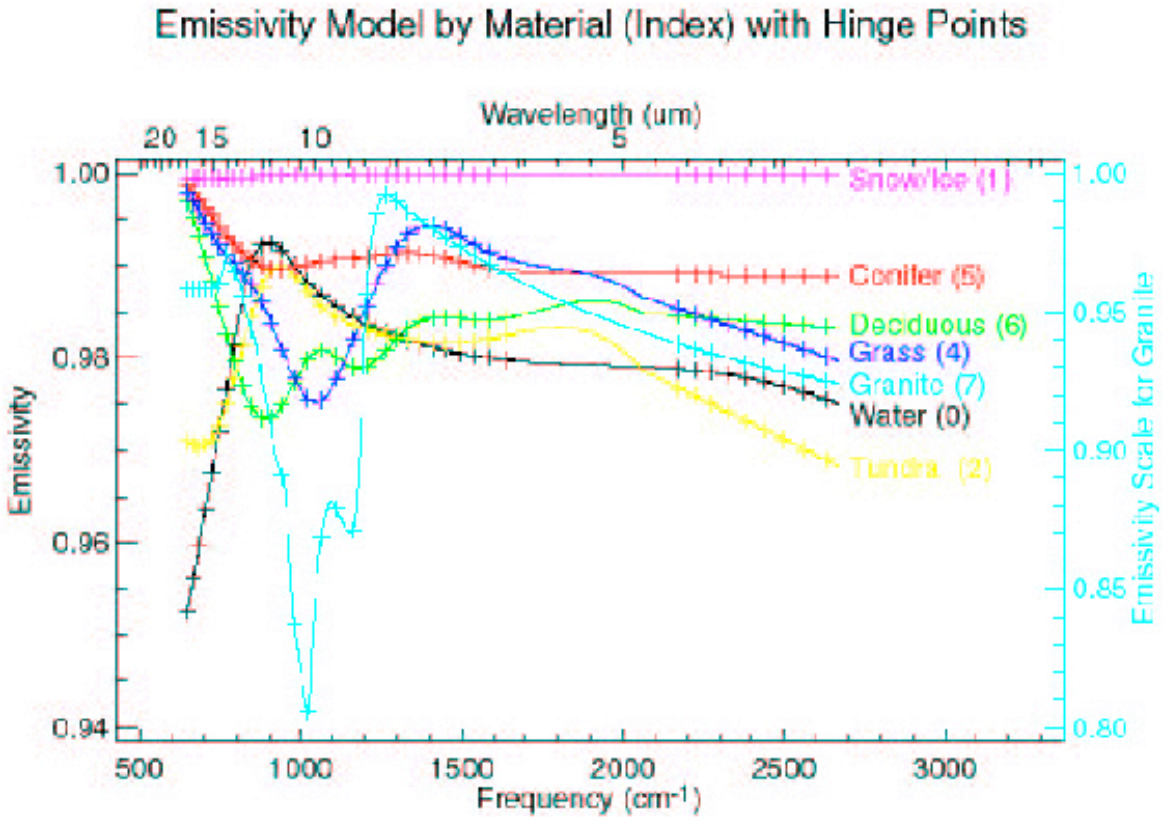
- Ocean – use Masuda model.
- Non-ocean – need emissivity retrieval
- Current emissivity retrieval is from eigenvector regression.
- Coefficients are based on simulations
- Applying synthetic regression on observed data can result in large biases.
- Cannot use collocated obs/ground truth to generate coefficients because no ground truth for surface emissivity.

Solution

- Use synthetic channel regression for surface parameters.
- Only a handful of 8 and 11 micron window channels are needed.
- Need to make sure that we have a robust training set of surface emissivity.

IR Emissivity Model

- Granite spectrum: IR handbook
- Others: spline interpolation of CERES database



Retrieval error based on 18 channels